

SECTION 16140

WIRING DEVICES

LANL MASTER CONSTRUCTION SPECIFICATION

When editing to suit project, author shall add job-specific requirements and delete only those portions that in no way apply to the activity (e.g., a component that does not apply). To seek a variance from applicable requirements, contact the ESM Electrical POC.

When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General Requirements.

Delete information within "stars" during editing.

Specification developed for ML-3 / ML-4 projects. For ML-1 / ML-2, additional requirements and QA reviews are required.

PART 1 GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

1. Receptacles
2. Snap switches
3. Dimmer switches
4. Wall plates
5. Multi-outlet assemblies
6. Occupancy sensing lighting controls

B. LANL PERFORMED WORK

1. None

1.2 SUBMITTALS

A. Submit the following in accordance with Section 01330.

1. Product Data

1.3 QUALITY ASSURANCE

A. Comply with the *National Electrical Code* (NEC).

- B. Furnish products listed and labeled by a nationally recognized testing laboratory (NRTL) for the application, installation condition, and the environments in which installed.
- C. Manufacturers of products addressed in this Section shall maintain an ISO 9001 certification.

1.4 RECEIVING, STORING AND PROTECTING

- A. Receive, store, and protect, and handle products according to NECA 1—*Standard Practices for Good Workmanship in Electrical Construction*.

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Alternate products may be accepted; follow Section 01630.

2.2 RECEPTACLES

- A. Provide back and side wired, screw pressure terminal, straight-blade and locking type, receptacles as indicated on the drawings. receptacles shall meet the performance and design requirements of NEMA Standard WD 1—*General Purpose Wiring Devices*, Federal Specification W-C-596F and UL Standard 498—*Electrical Attachment Plugs and Receptacles*. Receptacle configurations shall be in accordance with NEMA WD 6.
- B. For 120 volt convenience receptacles connected to general purpose branch circuits provide straight-blade NEMA 5-15R, 15 amperes, 125 volts, grounding duplex receptacles. Receptacle mounting strap, ground terminal, and ground contacts shall be formed from one piece of brass alloy. Manufacturer: Hubbell “5262”.
- C. For 120 volt receptacles connected to individual branch circuits provide straight-blade NEMA 5-20R, 20 amperes, 125 volts, grounding duplex receptacles. Receptacle mounting strap, ground terminal, and ground contacts shall be formed from one piece of brass alloy. Manufacturer: Hubbell “5362”.
- D. For computer or instrument 120 volt circuit receptacles provide straight-blade NEMA 5-15R, 15 amperes, 125 volts, isolated grounding duplex receptacles with orange triangle on face. Manufacturer: Hubbell “IG5262”.
- E. For computer or instrument 120 volt circuit receptacles connected to individual branch circuits provide straight-blade NEMA 5-20R, 20 amperes, 125 volts, isolated grounding duplex receptacles with orange triangle on face. Manufacturer: Hubbell “IG5362”.
- F. For ground fault circuit interrupter (GFCI) receptacles provide straight-blade NEMA 5-15R, 15 amperes, 125 volts, grounding, “feed through” type GFCI, duplex receptacle that meet the requirements of UL Standard 943, Ground Fault Circuit Interrupters. Provide units that can be installed in a 2-3/4-inch deep outlet box without an adapter. Manufacturer: Hubbell “GF5262”.

- G. For 120 volts, 20 amp circuit outlets serving electric water coolers (EWC) provide straight-blade NEMA 5-20R, 20 amperes, 125 volts, grounding, single receptacle. Receptacle mounting strap, ground terminal, and ground contacts shall be formed from one piece of brass alloy. Manufacturer: Hubbell "5361".
- H. Provide straight-blade and twist lock receptacles for special applications as indicated on the Drawings.

Edit 2.3 to match Project requirements; delete if not required. Match devices to plug connectors for LANL furnished equipment.

2.3 RECEPTACLES, INDUSTRIAL HEAVY DUTY

- A. For 20, 30, 60, and 100 ampere heavy duty splash-proof or watertight receptacle outlets, provide pin and sleeve type receptacles that are color coded and configured to the particular circuit voltage and current rating.
- B. Pin and sleeve receptacles shall be listed to UL Standard 498—*Electrical Attachment Plugs and Receptacles* and UL Classified to IEC Standards 309-1 and 309-2—*Plugs, Socket Outlets, and Couplers for Industrial Purposes*, and Series II rated for voltages and services.
- C. Provide a back box suitable for each particular receptacle device and installation location.
- D. Where indicated on the Drawings provide 20, 30, 60, and 100 ampere pin and sleeve receptacles with safety interlocks that will prevent making or breaking the receptacle connection under load.
- E. For each receptacle provide a matching plug.
- F. Manufacturer: Arrow Hart "Series 309".

Edit 2.4 to match Project requirements; delete if not required.

2.4 RECEPTACLES IN HAZARDOUS (CLASSIFIED) LOCATIONS

- A. Provide receptacles for hazardous locations, as indicated on the drawings, that comply with the performance and design requirements of NEMA Standard FB 11—*Plugs, Receptacles, and Connectors of the Pin and Sleeve Type for Hazardous Locations* and UL Standard 1010—*Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations*.

Edit 2.5 to match Project requirements; delete if not required.

2.5 PENDANT/CORD CONNECTOR DEVICES

- A. Provide matching, locking type, plug receptacle body connector, NEMA L5-20P and L5-20R, heavy-duty grade for pendant cords as indicated on the Drawings.

- B. Provide connector bodies fabricated from nylon or polycarbonate with screw-open cable-gripping jaws and provision for attaching an external cable grip.
- C. Provide external cable grips of the woven wire mesh type made of high-strength galvanized-steel wire strands, matched to cable diameter and with attachment provision designed for the corresponding connector.

Edit D to match Project requirements. Refer to LANL Engineering Manual Section D5020 for guidance.

- D. Cord shall be [600] [300] volt insulated, stranded copper conductors, with type [SO] [SOO] [SEO] [STO] [SJO] [SJOO] [SJEO] [SJTO] [G] [W] jacket and rated for [105 degree C] [90 degree C]. Grounding conductor not less than that required by the NEC and shall have green insulation. Conductor ampacity shall be equipment rating plus 25 percent minimum.

Edit 2.6 to match Project requirements; delete if not required.

2.6 CORD AND PLUG SETS

- A. Provide cord and plug sets that match voltage and current ratings and number of conductors to requirements of the equipment being connected.

Edit B. to match Project requirements. Refer to LANL Engineering Manual Section D5020 for guidance.

- B. Cord shall be [600] [300] volt insulated, stranded copper conductors, with type [SO] [SOO] [SEO] [STO] [SJO] [SJOO] [SJEO] [SJTO] [G] [W] jacket and rated for [105 degree C] [90 degree C]. Grounding conductor not less than that required by the NEC and shall have green insulation. Conductor ampacity shall be equipment rating plus 25 percent minimum.
- C. Plug shall be male configuration with nylon or polycarbonate body and integral cable-clamping jaws. Match to cord and to receptacle type intended for connection.

2.7 SNAP SWITCHES

- A. Provide single pole, double pole, three-way, four-way and illuminated handle snap switches as indicated on the Drawings.
- B. Switches shall be rated 20 amperes, 120-277 volt AC, back and side wired, screw pressure terminal, quiet type AC switch with yoke grounding screw. Switches shall meet the performance and design requirements of NEMA Standard WD 1—*General Purpose Wiring Devices*, Federal Specification WS-896E, and UL Standard 20—*General Use Snap Switches*.
- C. Manufacturer: Hubbell "HBL 1220" series

Edit 2.8 to match Project requirements; delete if not required.

2.8 SNAP SWITCHES IN HAZARDOUS (CLASSIFIED) LOCATIONS

- A. Provide snap switches for hazardous locations that comply with UL Standard 894—*Switches for Use in Hazardous (Classified) Locations*.
- B. Switch shall be rated 20 ampere, 120-277 volt AC, and shall meet the performance and design requirements of NEMA Standard WD 1—*General Purpose Wiring Devices*, Federal Specification WS-896E, and UL Standard 20—*General Use Snap Switches*.
- C. Manufacturer: Appleton “EDS”.

Edit 2.9 to match Project requirements; delete if not required.

2.9 WALLBOX DIMMING CONTROLS

- A. Provide wallbox mounted dimming control units that meet the requirements of UL 1492—*Solid-State Dimming Controls*. NRTL listing shall be specific to the type of load to be controlled.
- B. Each dimming control shall include a solid-state full-wave dimmer, quiet on-off switch, audible noise filter, and electromagnetic noise filter.
- C. Dimmer wattage rating shall exceed connected load by 30 percent minimum, unless otherwise indicated on the Drawings.
- D. Dimmer control shall provide full-range, continuously adjustable light output. Dimmer control may be by vertical slider, toggle, or rotary knob.
- E. Dimmer control shall include voltage compensation to stabilize light output with varying AC line voltage.
- F. Dimmer switch shall be a mechanical air-gap switch that opens at the dimmer minimum setting, with single-pole or 3-way operation as required to control the lighting in each space.
- G. Provide incandescent lamp dimmers as indicated on the Drawings. Equip dimmers with electromagnetic filter to eliminate noise, RF and TV interference. Manufacturer: Lutron “Nova”
- H. Provide fluorescent lamp dimmers for use with electronic ballasts specified in Section 16510, *Interior Lighting System*. Manufacturer: Lutron “Nova”

2.10 WALL PLATES

- A. For flush mounted interior receptacles and wall switches, provide 0.032 inch thick (minimum) brushed 302/304 alloy stainless steel smooth wall plates that meet the requirements of Federal Specification WP-455A. Manufacturer: Hubbell “S” series.

- B. For surface mounted interior receptacles and switches, furnish galvanized steel 4 inch square raised surface covers. Receptacles installed in raised covers shall be secured by more than one screw. Manufacturer: RACO "800" series.
- C. For GFCI receptacles in damp or wet locations, provide weatherproof, cast aluminum, hinged, self-closing device cover. Manufacturer: Hubbell "RCV1-GFR" or "RCH1-GFR"
- D. Provide single, multi-gang, and combination type wall plates that mate and match with corresponding wiring devices.
- E. Use metal plate-securing screws to match plate finish.

Edit 2.11 to match Project requirements; delete if not required. Use Section 16130, Surface Metal Raceway, where other than simple multi-outlet assemblies are required.

2.11 MULTIOUTLET ASSEMBLY

- A. Furnish multi-outlet assembly that meets the requirements of UL5 - *Surface Metal Electrical Raceways and Fittings*, and the NEC.
- B. Components of assemblies shall be products of a single manufacturer designed to be used together to provide a complete matching assembly of raceways and receptacles.

Select C, D, or E to match Project requirements. Standard stocked finish should be used in utilitarian spaces or where the raceway will be field painted. Grey should be used where it will match or accent architectural finishes. Stainless steel should be used only in laboratory spaces where there is the possibility of corrosion.

- C. [Furnish multi-outlet assembly surface metal raceway fabricated from cold rolled galvanized steel and coated with standard stocked baked enamel finish.]
- D. [Furnish multi-outlet assembly surface metal raceway fabricated from cold rolled galvanized steel and coated with a gray baked enamel finish.]
- E. [Furnish multi-outlet assembly surface metal raceway fabricated from Type 304 stainless steel.]
- F. Raceway shall be of a two piece design with a metal base and a snap on metal cover.
- G. Nominal dimensions of the assembled raceway shall be 1-1/4 inches wide by 3/4 inch high.
- H. Furnish fittings required for a complete installation.

Use I to match Project requirements for "standard" grounding receptacles.

- I. Provide multi-outlet assembly with pre-wired single NEMA 5-15R receptacles spaced [9] [12] [18] inches on center and wired alternately to 2 circuits with 3 No. 12 AWG THHN insulated conductors and a green THHN insulated No. 12 AWG ground wire.

Use J to match Project requirements for isolated ground power systems.

- J. [Provide isolated ground multi-outlet assembly with pre-wired single NEMA 5-15R isolated ground receptacles spaced [9] [12] [18] inches on center and connected to 1 circuit with 2 No. 12 AWG THHN insulated conductors and a green THHN insulated No. 12 AWG ground wire]
- K. Manufacturer: Wiremold "Plugmold 2000"

2.12 OCCUPANCY SENSING LIGHT SWITCHES

- A. For each private office with less than 300 square feet area, provide an NRTL-listed, dual voltage (120 and 277 volts), passive infrared automatic occupancy-sensing wall switch with 180 degree coverage, built-in light level sensor, adjustable time delay, adjustable sensitivity, and a switching technology that is suitable for electronic ballast inrush currents. Switch contacts shall be rated for at least 1200 watts ballast load at 277 volts. Manufacturer: The Watt Stopper "WS-200".
- B. For each private office with greater than 300 square feet area, provide an NRTL-listed, ceiling-mount combination passive-infrared/ultrasonic automatic sensor with built-in light level sensor, adjustable time delay, adjustable sensitivity, and an adjustable mounting bracket. Sensor shall have isolated relay contacts for interlocking with HVAC system controls. Provide power pack to derive operating voltage for sensor and to switch 20 amperes of ballast-type lighting load; power pack shall be suitable for use in air-handling plenums. Manufacturer: The Watt Stopper "DT-200".
- C. For open office and laboratory areas provide one an NRTL-listed, ceiling mount ultrasonic sensor per 1000 square feet or fraction thereof. Sensor shall have isolated relay contacts for interlocking with HVAC system controls. Provide power pack to derive operating voltage for sensor and to switch 20 amperes of ballast-type lighting load; power pack shall be suitable for use in air-handling plenums. Manufacturer: The Watt Stopper "WT-1100".
- D. For each conference room with less than 300 square feet area, provide an NRTL-listed, dual voltage (120 and 277 volts), passive infrared automatic occupancy-sensing wall switch with 180 degree coverage, built-in light level sensor, adjustable time delay, adjustable sensitivity, and a switching technology that is suitable for electronic ballast inrush currents. Switch contacts shall be rated for at least 1200 watts ballast load at 277 volts. Manufacturer: The Watt Stopper "WS-200".
- E. For each conference room with greater than 300 square feet area provide one an NRTL-listed, ceiling-mount combination passive-infrared/ultrasonic automatic sensor per 1000 square feet or fraction thereof to control the general lighting. Provide sensor having built-in light level sensor, adjustable time delay, adjustable sensitivity, and an adjustable mounting bracket. Sensor shall have isolated relay contacts for interlocking with HVAC system controls. Provide power pack to derive operating voltage for sensor and to switch 20 amperes of ballast-type lighting load; power pack shall be suitable for use in air-handling plenums. Manufacturer: The Watt Stopper "DT-200".

- F. For each computer room provide one an NRTL-listed, ceiling-mount combination passive-infrared/ultrasonic automatic sensor per 1000 square feet or fraction thereof. Provide sensor with built-in light level sensor, adjustable time delay, adjustable sensitivity, and an adjustable mounting bracket. Sensor shall have isolated relay contacts for interlocking with HVAC system controls. Provide power pack to derive operating voltage for sensor and to switch 20 amperes of ballast-type lighting load; power pack shall be suitable for use in air-handling plenums. Manufacturer: The Watt Stopper "DT-200".
- G. For each break room, file room, copy machine room, or utility room provide an NRTL-listed, ceiling-mount combination passive-infrared/ultrasonic automatic sensor with built-in light level sensor, adjustable time delay, adjustable sensitivity, and an adjustable mounting bracket. Sensor shall have isolated relay contacts for interlocking with HVAC system controls. Provide power pack to derive operating voltage for sensor and to switch 20 amperes of ballast-type lighting load; power pack shall be suitable for use in air-handling plenums. Manufacturer: The Watt Stopper "DT-200".
- H. For each restroom provide an NRTL-listed, ceiling mount ultrasonic sensor. Sensor shall have isolated relay contacts for interlocking with HVAC system controls. Provide power pack to derive operating voltage for sensor and to switch 20 amperes of ballast-type lighting load; power pack shall be suitable for use in air-handling plenums. Manufacturer: The Watt Stopper "WT-600".
- I. For each corridor provide one NRTL-listed, ceiling mount ultrasonic sensor per 90 ft or smaller segment. Provide power pack to derive operating voltage for sensor and to switch 20 amperes of ballast-type lighting load; power pack shall be suitable for use in air-handling plenums. Manufacturer: The Watt Stopper "WT-2200".

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify outlet boxes are installed at proper locations and heights.
- B. Verify wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- D. Clean debris from outlet boxes before installing devices.

3.2 INSTALLATION

- A. Install products following manufacturer's instructions. Have the manufacturer's installation instructions available at the construction site.
- B. Install devices plumb, level, and secure.
- C. Except as otherwise indicated on the Drawings, mount devices flush, with long dimension vertical, and grounding point of receptacles on top. Group adjacent switches and receptacles under single, multi-gang wall plates.

- D. Do not use the duplex/split-wire break-off tabs in receptacles as circuit conductors for connecting downstream devices.
- E. Cover devices and assemblies during painting.
- F. Install wall plates on switch, receptacle, and blank outlets after painting is complete.
- G. Install receptacle for electric water cooler (EWC) within EWC cabinet as recommended by manufacturer.
- H. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.3 DUAL-LEVEL LIGHTING CONTROL

- A. Provide dual-level lighting control in spaces 100 square feet and larger.
- B. Coordinate manual controls with automatic controls so the manual control can reduce the lighting load by at least 50 percent in a reasonably uniform lighting pattern.
- C. Coordinate dual-level lighting controls with day lighting apertures, such as windows.
- D. Coordinate dual-level-lighting controls with luminaire ballasts specified in Section 16510-*Interior Lighting System*.

3.4 GROUNDING

- A. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- B. Connect isolated ground receptacle grounding terminal to the isolated grounding conductor.

3.5 IDENTIFICATION

- A. Identify wiring devices as required in Section 16075—*Electrical Identification*.

3.6 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects before installing.
- B. Operate each operable device at least six times with circuit energized; verify proper operation.
- C. Test 15 and 20 ampere receptacles for proper polarity and ground continuity using an NRTL listed test device that impresses a momentary current of at least 15 amperes on the branch circuit conductors and equipment grounding path.
- D. Test ground-fault circuit interrupter receptacle operation with both local and remote fault simulations according to manufacturer recommendations.

1. Verify that GFCI will trip at 5 ± 1 mA current

2. Verify that GFCI does not trip at less than 1.8 mA current.

E. Replace damaged or defective wiring devices.

3.7 CLEANING AND ADJUSTING

A. Clean devices and wall plates. Replace stained or improperly painted wall plates or devices.

B. Adjust devices and wall plates to be flush and level.

Edit C and D to match Project requirements; delete if not required.

C. Adjust time-out controls each occupancy sensing light switches to the following settings:

1. Classrooms, private offices, open offices, laboratories, and restrooms: longest time out setting, but not more than 30 minutes.

2. Break rooms, storage rooms, and copy machine rooms: 5-minute time-out setting.

3. Conference rooms: 10-minute time-out setting.

4. Corridors and lobbies: 15-minute time-out setting.

D. Adjust ambient light sensor in occupancy sensors to hold off or reduce the electric lighting when daylighting exceeds 80% of the design illuminance at the work area. (For example, in an office with a design illuminance of 50 footcandles, the ambient light sensor should keep the lights off as long as the daylighting exceeds 40 footcandles.

END OF SECTION

Do not delete the following reference information:

This project specification is based on LANL Construction Specification 16140, Rev. 4, dated September 21, 2004.